22136013

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BIOLOGY
HIGHER LEVEL
PAPER 1

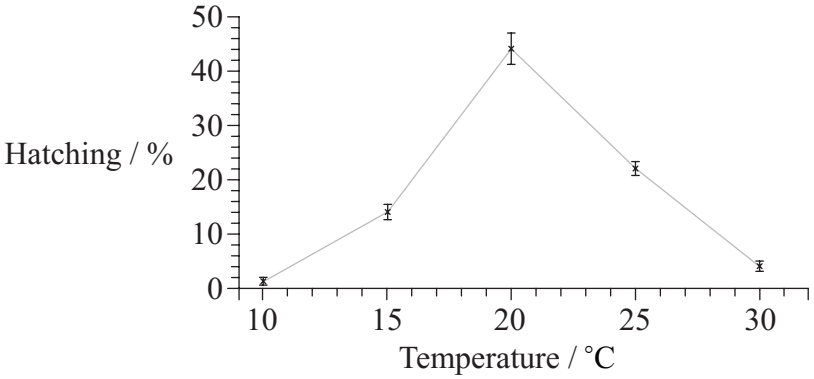
Monday 13 May 2013 (afternoon)

1 hour

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is *[40 marks]*.

1. The graph shows the effect of temperature on hatching of brine shrimp eggs (*Artemia* sp.).



What do the error bars indicate?

A. Measurements made at 10 °C have the greatest variability.

B. Greatest range for hatching is at 20 °C.

C. Measurements at each temperature are very similar to each other.

D. Standard deviation is greatest for the values measured at 15 °C.

2. What are stem cells?

A. Specialized cells that can be used therapeutically

B. Surplus cells taken from an embryo

C. Cells that retain their ability to divide and differentiate

D. Cells in the xylem and phloem tissues that support a plant

3. What causes cells to differentiate?

A. Sufficient nutrition

B. Full expression of all genes

C. Specialized functions at different stages of embryo development

D. Expression of some genes with suppression of other genes

4. What features of a cell favour efficient removal of waste products?

	Surface area	Volume
A.	high	high
B.	high	low
C.	low	high
D.	low	low

5. What actions occur during interphase?

A. DNA replication and RNA synthesis

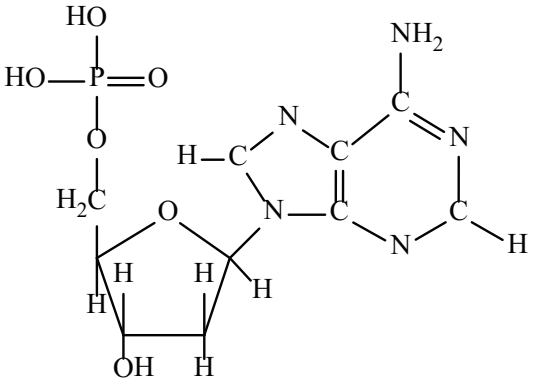
B. Spindle formation and DNA replication

C. Chromosome alignment at the metaphase plate

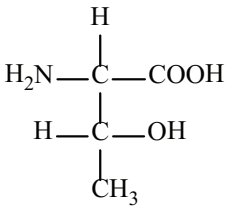
D. Growth and separation of sister chromatids

6. Which molecules show a monosaccharide and a fatty acid?

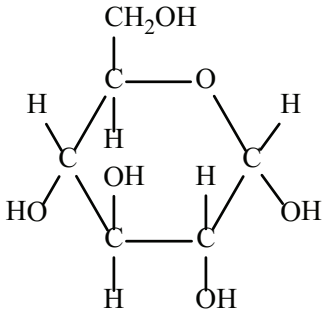
Molecule 1



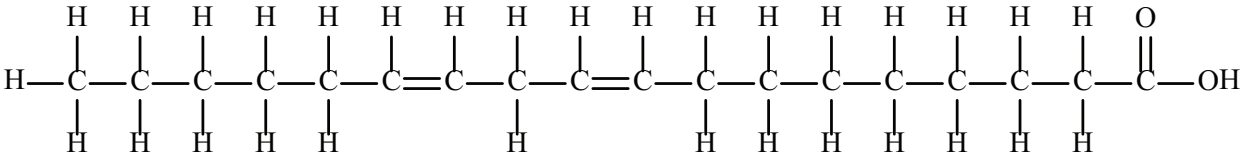
Molecule 2



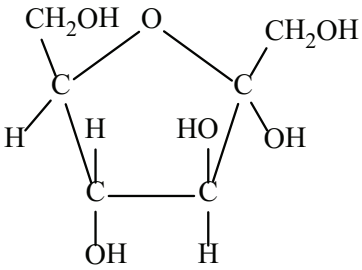
Molecule 3



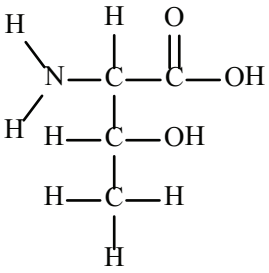
Molecule 4



Molecule 5



Molecule 6



	Monosaccharide	Fatty acid
A.	1, 3 and 5 only	2, 4 and 6 only
B.	1 only	2 and 6 only
C.	3 only	2 and 6 only
D.	3 and 5 only	4 only

7. What is formed from glucose during anaerobic cell respiration?

A. Lactate and ATP in cytoplasm

B. Carbon dioxide and water in mitochondria

C. Lactate and carbon dioxide in mitochondria

D. Carbon dioxide and water in cytoplasm

8. Which carbohydrates are used to provide energy storage in plants and animals?

	Plants	Animals
A.	starch	glucose
B.	cellulose	glycogen
C.	starch	glycogen
D.	maltose	glucose

9. What is the relationship between enzymes and DNA?

A. Enzymes contain the code for DNA.

B. Enzymes act on DNA during translation.

C. Both enzymes and DNA have similar shapes.

D. The structure of enzymes is determined by DNA.

10. For what purpose is the enzyme lactase useful?

A. Production of lactose-free milk so that more people can consume dairy products

B. As a dietary supplement to aid in protein digestion of milk

C. For use in coagulating milk protein to make cheese

D. To improve protein consumption in developing countries that lack milk

11. One type of gene mutation involves a base substitution.

Original DNA sequence:	GAC TGA GGA **CTT** CTC TTC AGA
mutated sequence 1:	GAC TGA GGA **CAT** CTC TTC AGA
mutated sequence 2:	GAC TGA GGA **CTC** CTC TTC AGA

mRNA codons for valine	GUU GUC GUA GUG
mRNA codons for glutamic acid	GAA GAG

What are the consequences of the base substitutions in the two new sequences of DNA?

A. Both are mutations that would result in different polypeptides.

B. Sequence 2 would result in a changed polypeptide but sequence 1 would not.

C. All three DNA sequences would translate into the same polypeptide.

D. Only the original DNA and sequence 2 would translate into the same polypeptide.

12. Which genetic condition can be diagnosed by karyotyping?

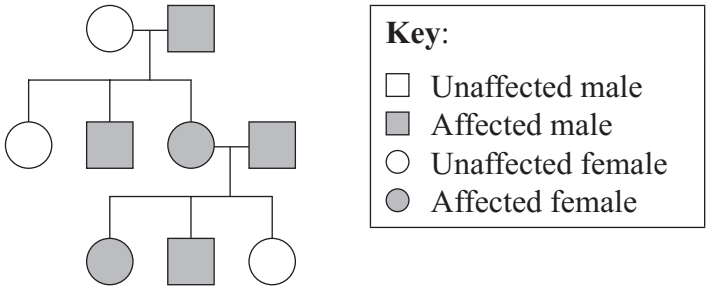
A. Trisomy 21

B. Sickle-cell anemia

C. Hemophilia

D. Colour blindness

13. The diagram shows a pedigree.



According to the pedigree shown, which pattern of inheritance is indicated?

A. Sex-linked recessive trait

B. Autosomal recessive trait

C. Autosomal dominant trait

D. Codominant alleles

14. If a father with A-type blood and a mother with B-type blood have a child, what is the probability that the child will have O-type blood?

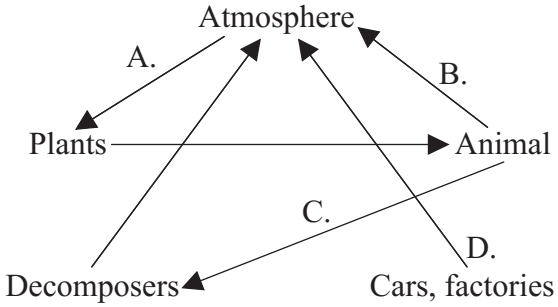
A. 50 % chance if both parents have the recessive allele.

B. 25 % chance if both parents have the recessive allele.

C. 0 % chance because neither parent has the allele.

D. 50 % chance if either parent has the recessive allele.

15. The diagram is a representation of a carbon cycle. Which arrow will reduce the greenhouse effect?



16. What would you expect to find in the fossil record if evolution had **not** occurred?

A. Fossils of simple organisms only in the oldest layers

B. Only fossils of extinct forms

C. Fossils of complex organisms only in the oldest layers

D. Same fossil forms in all layers

17. What distinguishes Annelida from Platyhelminthes?

A. Platyhelminthes have a segmented body but Annelida do not.

B. Platyhelminthes reproduce sexually but Annelida do not.

C. Platyhelminthes have radial symmetry but Annelida have bilateral symmetry.

D. Annelida have both a mouth and an anus but Platyhelminthes do not.

18. What features occur in all species of Angiospermophyta and Coniferophyta?

A. Seeds

B. Bark

C. Cones

D. Flowers

19. Enzymes produced by the pancreas could pass out of the body via the anus. Which route would these enzymes take to do this?

A. pancreas → liver → small intestine → rectum → anus

B. pancreas → gall bladder → small intestine → large intestine → anus

C. pancreas → small intestine → large intestine → anus

D. pancreas → large intestine → small intestine → anus

20. What causes the **rate** of heart contraction to increase or decrease?

A. The heart muscle itself

B. Nerve impulses from the brain

C. A hormone from the thyroid gland

D. The rate of return of blood to the left atrium

21. Why do nutrient molecules enter the blood?

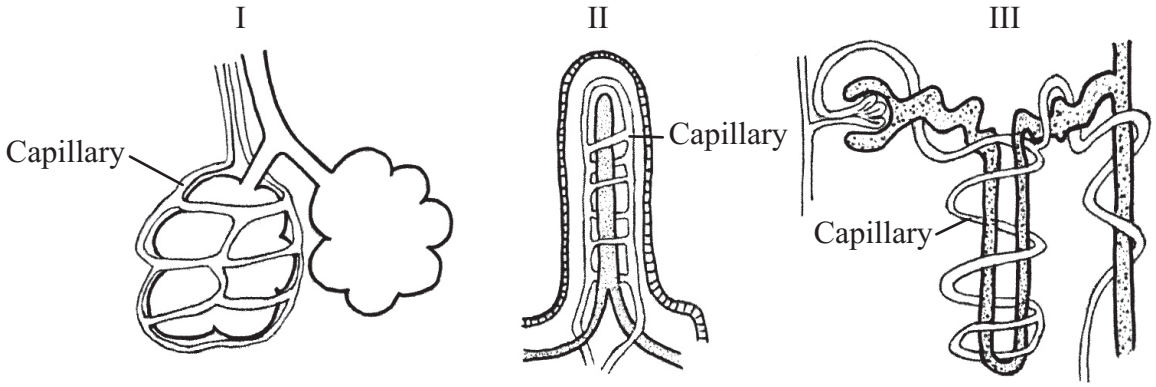
A. Blood carries nutrients to cells.

B. Blood converts nutrients into energy.

C. Nutrients and oxygen are mixed by blood.

D. Nutrients are stored in blood.

22. Where are structures I, II and III found in the human body?



	I	II	III
A.	kidney	large intestine	brain
B.	lungs	small intestine	kidney
C.	lungs	large intestine	kidney
D.	kidney	small intestine	brain

23. What initiates an action potential along a neuron?

A. Potassium and sodium ions diffuse out of a neuron.

B. Potassium and sodium ions diffuse into a neuron.

C. Neurotransmitters cause depolarization of membrane.

D. Acetylcholinesterase breaks down acetylcholine.

24. Why does shivering occur?

A. The body cannot control muscles when they become cold.

B. Shivering informs the brain that the body is too cold.

C. Shivering generates heat and raises body temperature.

D. The body diverts blood away from skin reducing heat loss.

25. How does DNA replicate?

A. The deoxyribose of a free nucleotide is linked to the phosphate of the last nucleotide in the chain.

B. The phosphate of a free nucleotide is linked to the deoxyribose of the last nucleotide in the chain.

C. Nucleotides are linked in a 3′ to 5′ direction and the new strands are anti-parallel to the template strands.

D. Nucleotides are linked in a 5′ to 3′ direction and the new strands are parallel to the template strands.

26. What are introns?

A. Sequences of nucleotides that are removed to form mature RNA in eukaryotes

B. Sequences of nucleotides that are removed to form mature RNA in prokaryotes

C. Sequences that remain in mature RNA after exons have been removed

D. Small pieces of circular DNA that are found in prokaryotes

27. The images below show muscle tissue.

Image I

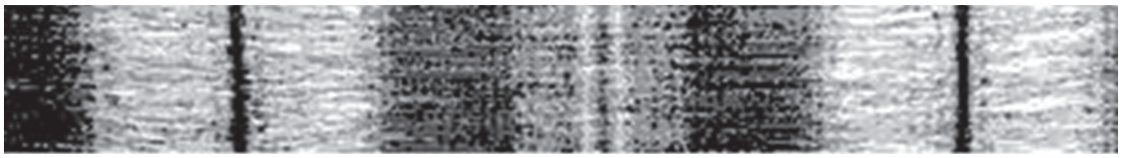
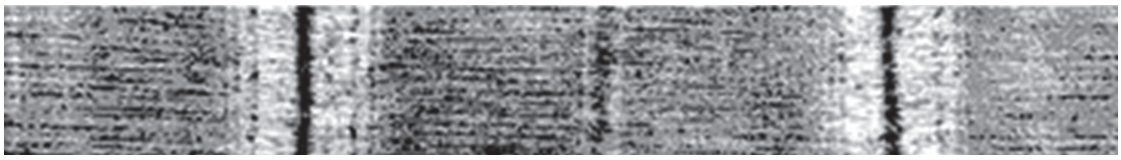


Image II



[Source: (Figure) from *Biology Course Companion* by Andrew Allott and David Mindorff (OUP, 2007), copyright © 2007, reprinted by permission of Oxford University Press.]

Which image shows contracted muscle tissue?

A. I because the dark band is narrower.

B. II because the Z lines are closer together.

C. II because there is less overlap between actin and myosin.

D. I because the dark bands are darker.

28. What is an allosteric site?

A. The area on an enzyme that binds the end-product of a metabolic pathway

B. The area on a competitor molecule that inhibits an enzyme reaction

C. The site on an enzyme where the substrate binds

D. The active part of a non-competitive inhibitor of an enzyme reaction

29. When is energy released in a cell?

A. ADP combines with inorganic phosphate.

B. ATP releases inorganic phosphate.

C. NAD^+ combines with hydrogen.

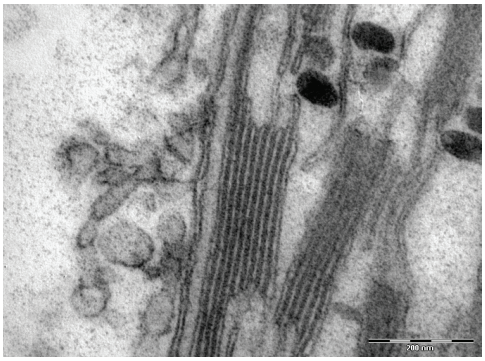
D. NAD^+ releases hydrogen.

30. In the electron photomicrographs which organelle is involved in vesicle formation?

A.

http://en.wikipedia.org/wiki/File:Mitochondria,_mammalian_lung_-_TEM.jpg

B.

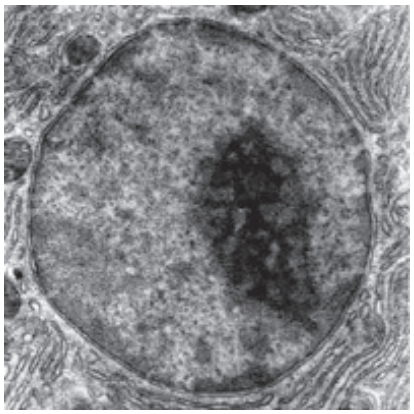


http://en.wikipedia.org/wiki/File:Chloroplast_in_leaf_of_Anemone_sp_TEM_85000x.png

C.

http://en.wikipedia.org/wiki/File:Human_leukocyte,_showing_golgi_-_TEM.jpg

D.



http://en.wikipedia.org/wiki/File:Micrograph_of_a_cell_nucleus.png

31. What is a characteristic of dicotyledonous plants?

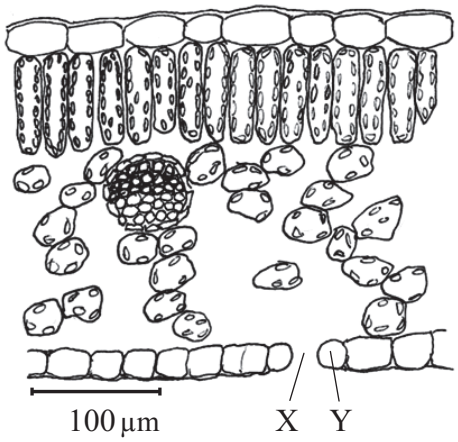
A. The flower parts are usually in threes or multiples of three.

B. The leaves have parallel veins.

C. The seeds contain a single cotyledon.

D. The root system has a taproot with lateral branches.

32. The diagram shows a cross-section through a leaf.



What is the relationship between structures X and Y?

A. Y causes X to open allowing water to exit the leaf when water is scarce.

B. Y responds to abscisic acid by closing X to prevent water loss.

C. Y responds to gibberellin by opening X to allow water loss.

D. Y causes X to close to increase transpiration.

33. Which process happens first during germination of a starchy seed?

A. Formation of gibberellin

B. Production of amylase

C. Absorption of water

D. Conversion of starch into monosaccharides

34. How does meiosis cause Mendel's law of independent assortment?

A. Linked genes are randomly separated.

B. The chromosome number is divided twice.

C. Crossing-over occurs in Anaphase I.

D. Alleles that are not in the same linkage group are segregated.

35. A test cross of **linked** genes was performed with fruit flies (*Drosophila melanogaster*).

Wild type body (B) is dominant to black body (b)
Normal wings (W) is dominant to vestigial wings (w)

BbWw crossed with bbww

The resulting offspring were
952 wild type body, normal wings
948 black body, vestigial wings
200 wild type body, vestigial wings
198 black body, normal wings

What is the most likely explanation for these results not fitting the expected ratio?

A. Crossing-over

B. Non-disjunction

C. Gene mutation

D. Random variation

36. Why do humans inherit continuous variation with regard to height?

A. The trait for tallness is dominant.

B. The height phenotype is polygenic.

C. This is a case of multiple alleles.

D. Height in humans is polyclonal with multiple alleles.

37. What is the function of thrombin in the process of blood clotting?

A. It acts as a catalyst.

B. It criss-crosses the wound to trap blood cells.

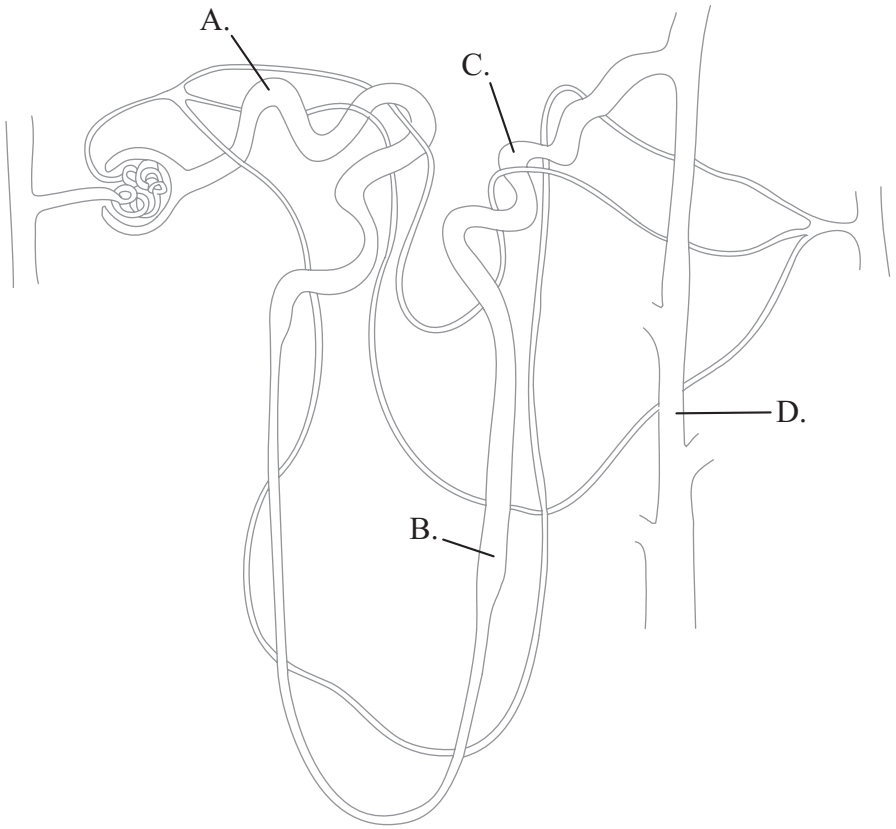
C. It changes from a soluble protein to an insoluble fibrous protein.

D. It releases clotting factors from platelets.

38. Which of the following events form the basis of immunity upon which the principle of vaccination is based?

	Clonal selection	Production of memory cells	Production of monoclonal antibodies	Challenge and response
A.	no	yes	yes	yes
B.	no	yes	no	yes
C.	yes	yes	yes	yes
D.	yes	yes	no	yes

39. In which part of the nephron is salt secreted from the tubule to increase osmotic potential?



40. Where is human chorionic gonadotrophin (HCG) produced?

A. Ovary

B. Anterior pituitary

C. Embryo

D. Posterior pituitary